

Application No. 09/676,363
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Amendments to the Claims

Please amend the claims as shown in the following list, which is submitted to replace all prior listings of claims.

1-10. (Canceled.)

11. (Currently Amended): A multi-lumen catheter comprising:

- a) an elongated cylindrical tube having a distal and a proximal end and a lumen therethrough;
- b) a transverse septum extending from the distal end to the proximal end of the tube within the lumen of the tube and dividing the tube into a return passageway and a withdrawal passageway, the withdrawal and return passageways open at the distal and proximal ends of the tube; and
- c) a supporting septum extending from the distal end to the proximal end of the tube and dividing the withdrawal passageway into first and second withdrawal lumens, the supporting septum supportingly engaging the transverse septum to support the transverse septum and deter deflection of the transverse septum.

12. (Original): A multi-lumen catheter according to claim 11 wherein the transverse septum includes a non-diametral septum.

13. (Original): A multi-lumen catheter according to claim 11 wherein the supporting septum resists vertical displacement.

14. (Original): A multi-lumen catheter according to claim 11 wherein the catheter is an indwelling catheter.

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15. (Original): A multi-lumen catheter according to claim 11 comprising a return septum extending from the distal end to the proximal end of the tube and dividing the return passageway into first and second return lumens.

16. (Original): A multi-lumen catheter according to claim 15 wherein the return septum resists vertical displacement.

17. (Original): A multi-lumen catheter according to claim 15 wherein the withdrawal lumens have a total cross-sectional area greater than or equal to that of the total cross-sectional area of the return lumens.

18. (Original): A multi-lumen catheter according to claim 15 wherein the withdrawal lumens have a combined flow resistance less than or equal to the combined flow resistance of the return lumens so that the total flow rate for blood flowing through the withdrawal lumens does not create a pressure differential sufficient to cause the withdrawal lumens to collapse.

19. (Original): A multi-lumen catheter according to claim 15 wherein the distal end includes first and second beveled surfaces angled away from one another.

20. (Original): A multi-lumen catheter according to claim 19 wherein the withdrawal lumens have distal ends disposed at the first beveled surface and the return lumens have distal ends disposed at the second beveled surface to reduce the mixing of blood between the return lumens and the withdrawal lumens.

21. (Original): A multi-lumen catheter according to claim 15 wherein the withdrawal lumens and the return lumens have cross-sectional shapes that are substantially devoid of sharp angles that are less than 90 degrees.

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22. (Original): A multi-lumen catheter according to claim 15 comprising an external flow coupler connecting the withdrawal lumens of the catheter to an external withdrawal tube and connecting the return lumens of the catheter to an external return tube.

23. (Original): A multi-lumen catheter according to claim 11 wherein the return passageway comprises a single return lumen.

24. (Original): A multi-lumen catheter according to claim 23 wherein the withdrawal lumens have a total cross-sectional area greater than or equal to that of the return lumen.

25. (Original): A multi-lumen catheter according to claim 23 wherein the withdrawal lumens have a combined flow resistance less than or equal to the flow resistance of the return lumen so that the total flow rate for blood flowing through the withdrawal lumens does not create a pressure differential sufficient to cause the withdrawal lumens to collapse.

26. (Original): A multi-lumen catheter according to claim 23 wherein the distal end includes first and second beveled surfaces angled away from one another and wherein the withdrawal lumens have distal ends disposed at the first beveled surface and the return lumen has a distal end disposed at the second beveled surface to reduce the mixing of blood between the return lumen and the withdrawal lumens.

27. (New): A multi-lumen catheter comprising:

- a) an elongated cylindrical tube having a distal and a proximal end and a lumen therethrough, said distal end of the tube having a first beveled surface and a second beveled surface angled away from the first beveled surface; and
- b) a transverse septum extending from the distal end to the proximal end of the tube within the lumen of the tube and dividing the tube into a withdrawal passageway and a return passageway, the withdrawal passageway open at the first beveled surface at the distal end of the tube, and the return passageway open at the second beveled surface at the distal end of the tube.

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28. (New): A multi-lumen catheter according to Claim 27 comprising a supporting septum extending from the distal end to the proximal end of the tube and dividing the withdrawal passageway into first and second withdrawal lumens.

29. (New): A multi-lumen catheter according to claim 28 wherein the supporting septum resists vertical displacement.

30. (New): A multi-lumen catheter according to claim 27 wherein the transverse septum includes a non-diametral septum.

31. (New): A multi-lumen catheter according to claim 27 wherein the catheter is an indwelling catheter.

32. (New): A multi-lumen catheter according to claim 27 comprising a return septum extending from the distal end to the proximal end of the tube and dividing the return passageway into first and second return lumens.

33. (New): A multi-lumen catheter according to claim 32 wherein the return septum resists vertical displacement.

34. (New): A multi-lumen catheter according to claim 32 wherein the withdrawal lumens have a total cross-sectional area greater than or equal to that of the total cross-sectional area of the return lumens.

35. (New): A multi-lumen catheter according to claim 32 wherein the withdrawal lumens have a combined flow resistance less than or equal to the combined flow resistance of the return lumens so that the total flow rate for blood flowing through the withdrawal lumens does not create a pressure differential sufficient to cause the withdrawal lumens to collapse.

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36. (New): A multi-lumen catheter according to claim 32 wherein the withdrawal lumens have distal ends disposed at the first beveled surface and the return lumens have distal ends disposed at the second beveled surface to reduce the mixing of blood between the return lumens and the withdrawal lumens.

37. (New): A multi-lumen catheter according to claim 32 wherein the withdrawal lumens and the return lumens have cross-sectional shapes that are substantially devoid of sharp angles that are less than 90 degrees.

38. (New): A multi-lumen catheter according to claim 32 comprising an external flow coupler connecting the withdrawal lumens of the catheter to an external withdrawal tube and connecting the return lumens of the catheter to an external return tube.

39. (New): A multi-lumen catheter according to claim 27 wherein the return passageway comprises a single return lumen.

40. (New): A multi-lumen catheter according to claim 39 wherein the withdrawal lumens have a total cross-sectional area greater than or equal to that of the return lumen.

41. (New): A multi-lumen catheter according to claim 39 wherein the withdrawal lumens have a combined flow resistance less than or equal to the flow resistance of the return lumen so that the total flow rate for blood flowing through the withdrawal lumens does not create a pressure differential sufficient to cause the withdrawal lumens to collapse.

42. (New): A multi-lumen catheter comprising:

- a) an elongated cylindrical tube having a distal and a proximal end and a lumen therethrough;
- b) a transverse septum extending from the distal end to the proximal end of the tube within the lumen and dividing the tube into a return passageway for carrying fluid at first pressure, and a withdrawal passageway for carrying fluid at

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a second pressure, said first and second pressures creating a pressure differential across said transverse septum; and

- c) a supporting septum engaging said transverse septum and restraining said transverse septum against deflection in response to said pressure differential to substantially prevent collapsing of the transverse septum into the withdrawal passageway.

43. (New): A multi-lumen catheter according to claim 42 wherein said supporting septum divides the withdrawal passageway into first and second withdrawal lumens.

44. (New): A multi-lumen catheter according to claim 42 wherein the withdrawal and return passageways are open at the distal and proximal ends of the tube.

45. (New): A multi-lumen catheter according to claim 42 wherein the transverse septum includes a non-diametral septum.

46. (New): A multi-lumen catheter according to claim 42 wherein the catheter is an indwelling catheter.

47. (New): A multi-lumen catheter according to claim 42 comprising a return septum extending from the distal end to the proximal end of the tube and dividing the return passageway into first and second return lumens.

48. (New): A multi-lumen catheter according to claim 47 wherein the return septum engages said transverse septum and restrains said transverse septum against deflection in response to said pressure differential to substantially prevent collapsing of the transverse septum into the withdrawal passageway.

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49. (New): A multi-lumen catheter according to claim 47 wherein the withdrawal lumens have a total cross-sectional area greater than or equal to the total cross-sectional area of the return lumens.

50. (New): A multi-lumen catheter according to claim 47 wherein the withdrawal lumens have a combined flow resistance less than or equal to the combined flow resistance of the return lumens.

51. (New): A multi-lumen catheter according to claim 47 wherein the distal end includes first and second beveled surfaces angled away from one another.

52. (New): A multi-lumen catheter according to claim 51 wherein the withdrawal lumens have open distal ends disposed at the first beveled surface and the return lumens have open distal ends disposed at the second beveled surface, to reduce the mixing of fluid between the withdrawal and return lumens.

53. (New): A multi-lumen catheter according to claim 47 wherein the withdrawal and return lumens have cross-sectional shapes that are substantially devoid of sharp angles that are less than 90 degrees.

54. (New): A multi-lumen catheter according to claim 47 comprising an external flow coupler connecting the withdrawal lumens of the catheter to an external withdrawal tube and connecting the return lumens of the catheter to an external return tube.

55. (New): A multi-lumen catheter according to claim 42 wherein the return passageway comprises a single return lumen.

56. (New): A multi-lumen catheter according to claim 55 wherein the withdrawal lumens have a total cross-sectional area greater than or equal to the total cross-sectional area of the return lumen.

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57. (New): A multi-lumen catheter according to claim 55 wherein the withdrawal lumens have a combined flow resistance less than or equal to the flow resistance of the return lumen.